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# Laparoscopic Adrenalectomy: A 10-year experience of 65 cases in Rajavithi Hospital.

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## Abstract

**Background:** Laparoscopy has become the gold standard for the treatment of adrenal tumors in urology. We evaluate our experience with laparoscopic adrenalectomy (LA) in this work.The aims of this paper were to review our experience with laparoscopic transperitoneal adrenalectomy, report on outcomes, and demonstrate any learning curve with the technique.

**Methods:** A review of our database and patient records was carried out total of 65 laparoscopic adrenalectomyfor the period January 2001 to December 2010. Patient demographics, tumor characteristics, operating times, outcomes and lengths of stay were studied. Diagnostic tools, including tumour size on pathological section were reviewed.

**Results:** Indications for surgery included patients with primary hyperaldosteronism (39 adenomas, 3 hyperplasias), 10 phaeochromo-cytomas, 8 cortisol-secreting adenomas, 1 adrenal cyst, 1 metastasis, 1 lymphoma, 1 myelolipoma and 1 ganglioneuroma. The tumors ranged in size from 10 to 85 mm. All tumors were localized and lateralized preoperatively using standard techniques. Throughout the review period, twenty-three open procedures were undertaken electively, for various reasons. 9 cases were converted to open procedures (13.8%).Fourty-six left and 19 right procedures were undertaken. For all laparoscopic procedures, the average time in the operating theatre was 188.2 min. Men took 193.5 min compared with 187.3 min for women. Left-sided lesions took 183.0 min compared with 200.8 min for right-sided lesions. The average length of stay was 11.9 days. There was one splenic and pancreatic injury.

**Conclusion:** The results achieved in our initial experience with this technique are comparable with the published literature. The results confirm that laparoscopic adrenalectomy is the method of choice for resection of benign adrenal pathology. The procedure has a learning curve and should be performed by a surgeon experienced in both open and laparoscopic adrenal surgery.

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## Introduction

The first laparoscopic adrenalectomy was performed by Michel Gagner in 1992.[1] Since then it has become a standard surgical approach for benign adrenal tumors.Compared with the traditional open resection, laparoscopic adrenalectomy has decreased requirement for postoperative analgesia and is characterized by a shorter hospital stay, better patient satisfaction, and an earlier return to normal diet and activities.[2] These clear advantages of laparoscopic adrenalectomy did not encourage any prospective randomized controlled trials comparing the new technique with the classical 'open', either trans-abdominal or retroperitoneal technique.We report a series of 65laparoscopic adrenalectomies carried out during a period of 10 years in our center.

## Materials and Methods

A total of 65 laparoscopic adrenalectomies performed between January 2001 to December 2010 at our institution were reviewed retrospectively. Characteristics of the patients are listed in Table 1. Laparoscopy was limited to well-encapsulated masses without radiologic evidence of periadrenal involvement or obvious lymphadenopathy.Imaging findings were indicative of a tiny nodule. Urinary levels of free cortisol and vanilmandelic acid, along with plasma levels of adrenocorticotropic hormone dehydroepiandrosterone, 17-hydroxy progestrone, testosterone, rennin, and aldosterone were measured preoperatively, as indicated. Complete hormonal tests were performed preoperatively in patients with incidentally detected adrenal masses.

All of the patients underwent abdominal computed tomography and magnetic resonance imaging. Correction of metabolic derangements in patients with Cushing syndrome and hyperaldo-steronism, and control of pheochromocytoma-induced hypertension was achieved with $\alpha$-adrenergic or $\beta$-adrenergic blockage before surgical operation. Lateral transperitoneal approach was our routine in all patients. All of the patients underwent bowel preparation the day before the procedure. They were secured in a 90-degree lateral position for surgical operation. The techniques of the lateral transperitoneal approach that we used have as standard trans-peritoneal laparoscopic adrenalectomy.[3-5] In the right adrenal tumors, if the tumor size was less than 4 cm, the adrenal vein was exposed from its origin on the inferior vena cava and was clipped or coagulated by bipolar cautery. If the adrenal tumor was larger (> 4 cm), we tried to coagulate or clip the adrenal vein as close to the tumor as possible with special care not to avulse the adrenal vein from the vena cava. We

**Table 1** *Characteristics of the Patients Underwent Laparoscopic Adrenalectomy*

| Characteristics | Values (%) |
|---|---|
| Number of patients | 65 |
| Sex | |
| Male | 10 (15.4) |
| Female | 55 (84.6) |
| Mean age, y | 38.9 (14-72) |
| Tumor side | |
| Right | 9 (13.8) |
| Left | 56 (86.2) |

*Values in parentheses are percents.

performed adrenalectomy in patients with pseudcysts with thick or irregular walls, suspicious of malignancy. Data on the patients' characteristics, hospital records, and follow-up visits were collected. Improvement of hypertension was defined as a lower blood pressure and/or reduction of antihypertensive medications.

The results were presented as percentages and mean, where appropriate.

## Results

Table 1 show Characteristics of the Patients Underwent Laparoscopic Adrenalectomy.

### Operative result

The overall mean age was 38.9 years (range, 14-72 years) in Table 1, and the ratio of female to male was slightly over 5:1. Fourty-six of the adrenalectomies were performed onthe left and nineteen were performed on right. The mean operating time was 188.2 minutes and ranged from 100 to 385 minutes. In our experience, a right-sided procedure required an average of 205.5 minutes compared to 184.0 minutes for a left-sided procedure.Indications for adrenalectomy in our series are listed in Table 2, and the operative results are shown in Table 3.

There were 4 patients (6.2%) among our 65 cases who had a tumor larger than 6 cm in diameter. The most common indication for laparoscopic adrenalectomy in our series was a Aldosterone-producing adenoma (n = 42). Six patients (9.2%)

**Table 2** *Indications for Laparoscopic Adrenalectomy*

| Indication | Patients (%) |
|---|---|
| Aldosterone-producing adenoma | 42 (64.6) |
| Pheochromocytoma | 10 (15.4) |
| Cushing syndrome (macronodular adrenocortical hyperplasia) | 8 (12.3) |
| Adrenal cyst | 1 (1.5) |
| Schwannoma | 1 (1.5) |
| Myelolipoma | 1 (1.5) |
| Lymphoma | 1 (1.5) |
| Metastasis Adenocarcinoma of ovary | 1 (1.5) |

**Table 3** *Operative Outcomes of Laparoscopic Adrenalectomy*

| Outcome Parameter | Value |
|---|---|
| Mean operative time, min | 188.2 (100-385) |
| Male | 189.7 (100-385) |
| Female | 193.5 (145-230) |
| Right side | 205.5 (100-385) |
| Left side | 184.0 (130-290) |
| Conversion to open surgery | 9 (13.8) |
| Pancrease and splenic injury | 1 (1.5) |
| Length of stay | 11.9 (3-53) |
| Postoperative hospital stay | 7.1 (2-29) |

were classified as having nonfunctioning adrenal tumors. These patients no specific symptom or history of hypertension

The overall intraoperative complication rate was 1.5% (1 patients). There was iatrogenic injury to the pancrease and spleen required intraoperative blood transfusion and conversion with splenectomy. (Table 3).

Conversions occurred during the first 3 years of our experience (Figure 1.), in the first 10 patients, most conversion due to bleeding no major complication. In addition, the mean operative time decreased significantly in the last 3 years. Post-operative mean hospital stay was 7.1 days (range, 2 to 29 days). average size of the lesion 3.3 (range, 1-7.5 cm), no reoperation was required in all patient was performed laparoscopically. Patients with pheochromocytoma generally are considered separately in surgical studies.[6] These tumors generally are larger: in our series, 5.1 cm versus 2.9 cm inpatients who did not have pheochromocytoma. Operative time also was longer, 218 min versus 181.8 hours.

In all laparoscopic adrenalectomy patients in same period. The most common postoperative histopathological diagnosis was adenoma (Table 4). The specific histopathological diagnoses of benign adrenaltumors were equally distributed in both groups. Four adrenocortical carcinomas were operated only on open adrenalectomy (OA).

After the operation, all of the patients were referred to an endocrinologist for evaluation. Improvement of hypertension was achieved in 31 of 34 patients (91.2%) with pheochromocytoma, hyper-aldosteronism and Cushing syndrome. There was no evidence of biochemical relapse in hormonally active tumors, however there was no perioperative mortality.

## Discussion

Indications for adrenal surgery had been well established before the introduction of minimal invasive techniques. Functional adrenal tumours are still common disorders requiring surgery. LA has recently been considered by many authors as a “gold standard” in the removal of benign adrenal functioning tumours.[7,9-11] Additionally, during the last two

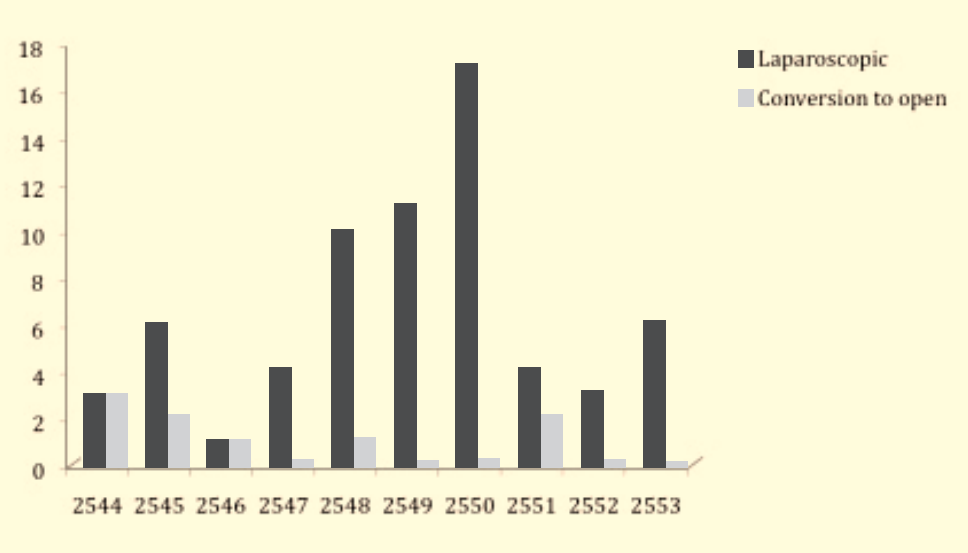


**Fig.1** *Conversion to open in 10 years of laparoscopic adrenalectomy*

**Table 4** *Postoperative histopathological diagnosis of all removed adrenal tumors (Open and laparoscopic, 88 pts.)*

| Indication | Patients (%) |
|---|---|
| Aldosterone-producing adenoma | 48 (54.5) |
| Pheochromocytoma | 14 (15.9) |
| Cushing syndrome (macronodular adrenocortical hyperplasia) | 10 (11.4) |
| Adrenocortical carcinoma | 4 (4.5) |
| Metastasis | 3 (3.4) |
| Lymphoma | 2 (2.3) |
| Adrenal cyst | 1 (1.1) |
| Schwannoma | 1 (1.1) |
| Myelolipoma | 1 (1.1) |
| Neurilemoma | 1 (1.1) |
| Leiomyosarcoma | 1 (1.1) |
| Histoplasmosis | 1 (1.1) |

decades an increasing number of incidentally discovered adrenalnon-functioning lesions accompanied by the availability of LA has prompted a discussion regarding the optimal indications for surgery in such tumours.[7,8,11] The increasing number of patients diagnosed with incidentalomasis a direct consequence of the common use of ultrasound, CT, and MRI imaging of the abdominal cavity for various indications. The main indication for removal of a non-functioning benign adrenal tumour is the lesion diameter. However, there is no consensus in the literature regarding the optimal size of the tumorin need of surgical intervention.

After ten years of our own experience with LA, and based on the available studies [7,12,16,17], we accept the diameter of incidentalomas between 4 and 8 cm as an indication for preferred laparoscopic approach. Solid, benign, and non-functioning adrenal lesions with diameter of less than 4 cm are considered for surgery only in patientswith severe blood hypertension after all the other possible causes of hypertension were excluded.[18] Moreover, the incidence of malignancy is higher in cases of lesions of diameter greater than 6 cm or weighing more than 100 g are highly likely to be malignant.(13,19-21] Sinceminimal invasive surgery was introduced in our institutionin 2001, Open adrenalectomy (OA) has been used to remove only 15 benign adrenal tumours versus 63 done by LA.

The optimal choice of surgical approach in adrenal surgery depends on many factors. The most important includes the dimensions of the mass, its location, the endocrine and oncological nature of the lesion, the patient preoperative condition, and the surgeon's experience.[22] Small functioning or non-functioning adrenaladenomas and other benign adrenocortical tumorsmay be successfully removed by employing LA.[16,21]

During the first four years of our experience, we limited the laparoscopic approach tobenign tumors less than 6 cm in diameter, and our first laparoscopic resection of adrenal tumors larger than 6 cm were performed afterwe had the experience of 20 laparoscopic adrenalectomies in patients with small eradrenal tumors, and thus, we had considerable experience with this procedure before we encountered

patients with this large adrenal tumors, and this may have influence ourresults.

In our study group, the mean size of adrenal masses resected by laparoscopic adrenalectomy was 3.3 cm (range, 1 cm to 8.5 cm). The larger lesions, often involvingnumerous vessels, required special perioperative attention, but no increase inconversion rate was noted because there was no complication or conversion in large tumors.

According to the published data and our own experience, transperitoneal laparoscopic adrenalectomy is particularly suitable for pheochromocytoma and lesions diameter less than 8 cm in diameter.[22-24]

However, a suspicion or definitive preoperative diagnosis of invasive adrenal carcinoma or malignant pheochromocytoma represents, in many centres, a specificindication for open transperitoneal surgery.[4,21,23,25,26]

It gives wide operative access to the adrenal tumour as well as allowing the detailed inspection of the surrounding organs and their possible infiltration.[27] Nevertheless, some authors have proved that in carefully selected cases metastatic adrenal lesions or adrenal carcinomas that do not infiltrate surrounding tissuemay be treated laparoscopically.[4,9,10,23,25,28]

However, in view of our limited experience in laparoscopic removal of malignant adrenal tumours, this indication appears very controversial.

The malignant potential only becomes true when confirmed by evidence of spreading beyond the adrenal capsule or adrenal veinon pathological examination.

We needed to convert LA to OA in case of metastasis serous cystadeocarcinoma of ovary lesion due to bleeding from the tumor and its infiltration into the surrounding organs, which was not detected preoperatively. Laparoscopic adrenalectomy requires a longer operative time compared to open adrenalectomy.[7,8,10] It seems to bea major disadvantage of minimal invasive surgery. Ourstudy has also revealed the significantly longer mean duration of laparoscopic versus open adrenalectomy. Additional concerns about port-site metastases and local recurrences are theoretically justifiable, but the actual risk has remained unknown.[29-31] We did not have any port-site metastasis.

## Conclusion

Our series confirmed that laparoscopic adrenalectomy is a safe and effective procedure, associated with minimal morbidity. Also, we concluded that most adrenal masses are potentially amenable to a laparoscopic approach if there is no evidence of periadrenal invasion or lymphadenopathy. We recommend laparoscopic adrenalectomy as a “gold standard” in the surgery of both functioning and non-functioning benign adrenal tumors of diameter less than 8 cm.

However, meticulous preoperative workup should beperformed in order to classify the type oflesion and to attain more certainty about its anatomical relations. Careful preoperative planning will help the surgeon to optimize surgical indications and will minimize the occurrence of unexpected events during surgical operation.

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